

Writing Ultra Fractal Calculation Formulas

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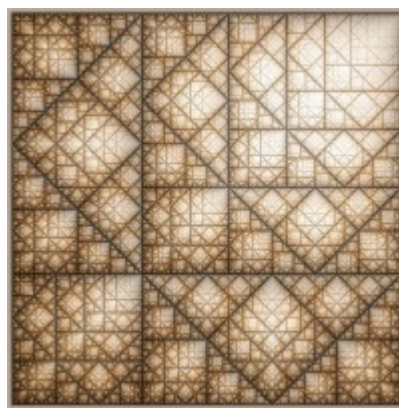
[Class bulletin board](#) **Welcome** [Lesson 1](#)
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Course Overview:

Ultra Fractal is a tremendous program for generating fractal images. Its strength comes in large part from its ability to apply user-written formulas. For example, each of the images shown in Figure 1 was created with formulas I wrote. Thousands of formulas are publicly available and any user is free to write his or her own to further extend Ultra Fractal's capabilities. While there is a great diversity in the available algorithms, the basics of writing formulas are readily accessible. That's what we will cover in these two courses. The first course is about concepts common to all formula types and the calculation formula in particular. The follow-on course covers coloring and transformation formulas.



General-purpose formulas



Specialized formulas



Single-use formulas

Figure 1: Examples of images that can be created with Ultra Fractal

Pre-requisites and Skill Level:

You must have Ultra Fractal 3 or 4 installed on your machine and should have worked through the tutorials. I will assume that you can:

- Open, close, and save images
- Load parameter sets
- Load and edit gradients
- Load calculation formulas (Formula tab)
- Load coloring formulas (Inside and Outside tabs)
- Load transformation formulas (Mapping tab)

Subjects Covered:

The following topics will be addressed in the six lessons of this course:

1. Introduction
 - What kinds of formulas does Ultra Fractal use?
 - How are these formulas used?
 - Where to find formulas?the public database
 - Formula titles and identifiers
2. A Little Math
 - Review of the arithmetic operations
 - 2D coordinate geometry
 - Analytic geometry
 - Complex number arithmetic
 - The Mandelbrot formula
 - Comparing calculations and images
3. The Anatomy of a Calculation Formula
 - Formula structure
 - Variable declarations & initializations
 - Looping
 - The bailout criterion
 - Modifying formulas (including ethics)
4. Escape-time Formulas
 - Mandelbrots, Julias, and the Switch mode
 - Other divergent escape-time formulas
 - Convergent formulas (e.g., Newton)
5. Other Formula Types
 - Pixel
 - Popcorn/Gnarl/Carmelcorn
 - Scientific simulations
 - Special purpose (e.g., Embossing)
6. Publishing your Formulas
 - Have an idea!
 - Testing (alpha, beta, gamma)
 - Backwards compatibility
 - Default parameters
 - Commenting
 - Help files
 - Adding to the database

Conventions

In order to keep everything straight, I will be using a few conventions:

- Regular text (like this) will be shown in Tahoma font.
- Text that is part of a formula code listing (like `z=sqr(z)+c`) will be shown in the Courier New font.

Getting Help

If you have questions about the material, post them on the class bulletin board.

How to Receive a Certificate for This Course

If you would like to receive a certificate for this course, then be sure to complete all of the homework assignments as instructed.

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